PARAGE

➔ Assessing agri-environmental impacts in the French West Indies and French Guiana

F.Baillarin[1], G.Lainé[2], B.Ariaux[3], D.Desprès[3], J.M.Fotsing[4], K.Ose[4], G.Gonzales[1]

[1]Spot Image, [2]CIRAD, [3]SIGbea, [4]IRD

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➔ 28th EARSeL Symposium and Workshops, 2-7 June 2008, Istanbul, Turkey

IRD
Institut de recherche pour le développement

CIRAD

SPOT IMAGE

SIGbea
Systèmes d'Information Géographique pour les besoins en environnement et aménagement

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
MINISTÈRE DE L'AGRICULTURE ET DE LA PÊCHE

➔ **PARAGE :**
Assessing Agri-Environmental impacts in the French West Indies and French Guiana :
A space-based tool for assessing environmental impacts

- **Innovative study on the evaluation of the impact of farming practices on natural environment**
- **Project co-funded by the French ministry of agriculture and fisheries**
- **2 years project : March 20, 2006 – March 27, 2008**

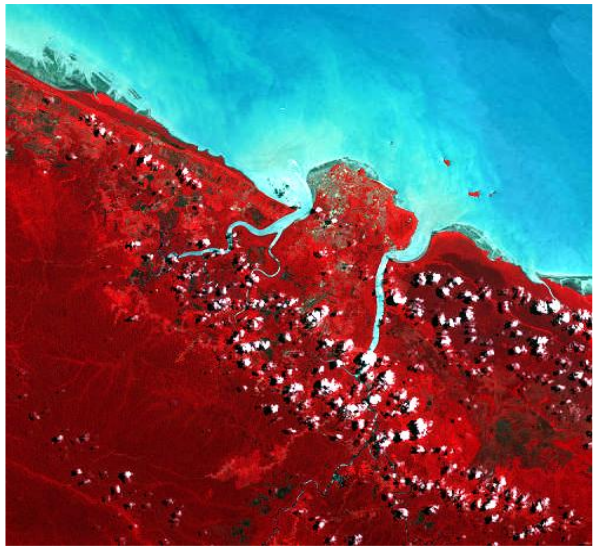
Objectives

➔ Project objectives

- **To evaluate the contribution of remote sensing technology for the agri-environment diagnosis in the French West Indies and French Guiana**
  - Support for the creation and updating of agricultural and natural land cover maps
  - Support for the set up of regulations regarding natural resources and territorial management
  - Risk assessment and monitoring
- **To strengthen cooperation between users**
  - Sharing of geographic information
- **To demonstrate the contribution of the SPOT satellite image receiving station set up in French Guiana in Feb 2006**

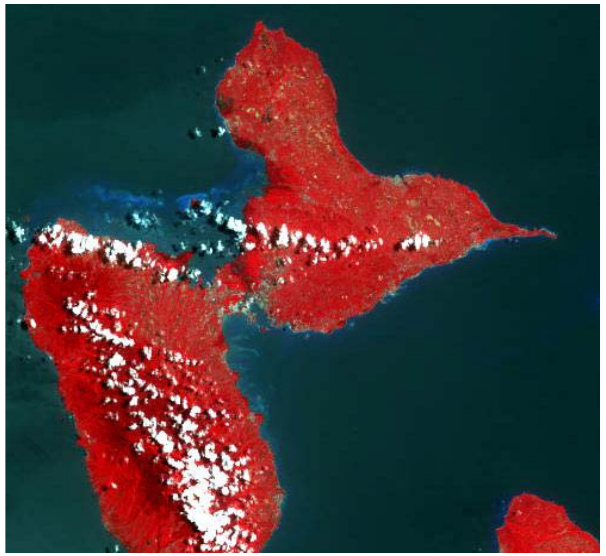
Needs analysis : issue to be selected

➔ **3 regions with different issue**



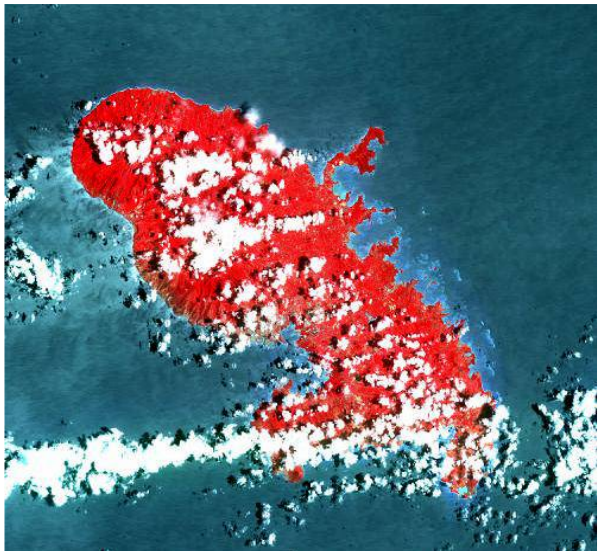
French Guiana

Deforestation monitoring for slash-and-burn agriculture



Guadeloupe

Evaluation of agricultural pressure over sensitive or protected environments



Martinique

Soil erosion risk assessment on the “Baie du Robert” watershed

Needs analysis: geo-indicators

➔ **Geo-indicators to answer users needs**

- Synthetic vision of a problem in order to better understand it
- Based on reliable and easily accessible data
- Sensitive to expected changes
- Understood and accepted by its users
- Meet spatial criteria (calculated from spatial data)
- Answer agri-environnemental issues

=> Focus on the spatial relationships that exist between a parcel and its environment

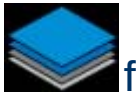
Needs analysis: GIS demonstrator

➔ Aim

- To provide non GIS specialists with a simple tool to assess agri-environmental issues
- To ease the exchange & share of information between users
- To implement the geo-indicators and enhance their dynamic nature
- To disseminate the map products derived from satellite image processing

➔ Selected technologies

- **Open Source**
  - Database : POSTGIS
  - Map Server : Geoserver
  - Interface : OpenLayers
- **Meeting with OGC standards**
  - WMS, WFS, SLD & compatibility future standards, WPS
- **Customisable**
  - Interface
  - Geo-Indicators



Needs analysis: GIS prototype

http://parage.sigbea.fr

Results in Martinique

➔ Issue & Study site:

- Soil erosion risk assessment on the “Baie du Robert” watershed

➲ Geo-indicator: « Soil sensitivity to erosion »

- Adapting the PRAM-Cemagref soil erosion risk assessment model
  - 4 layers of information :
    - → Land cover
    - → Slope
    - → Run-off accumulation
    - → Soil condition
  - Calculation of a sensitivity index according to a decision-tree

➔ Map products:

- Land cover map
- Slope map
- Slope length map
- Soil map

Martinique: “La Baie du Robert”

SPOT image from 14-Nov-2006

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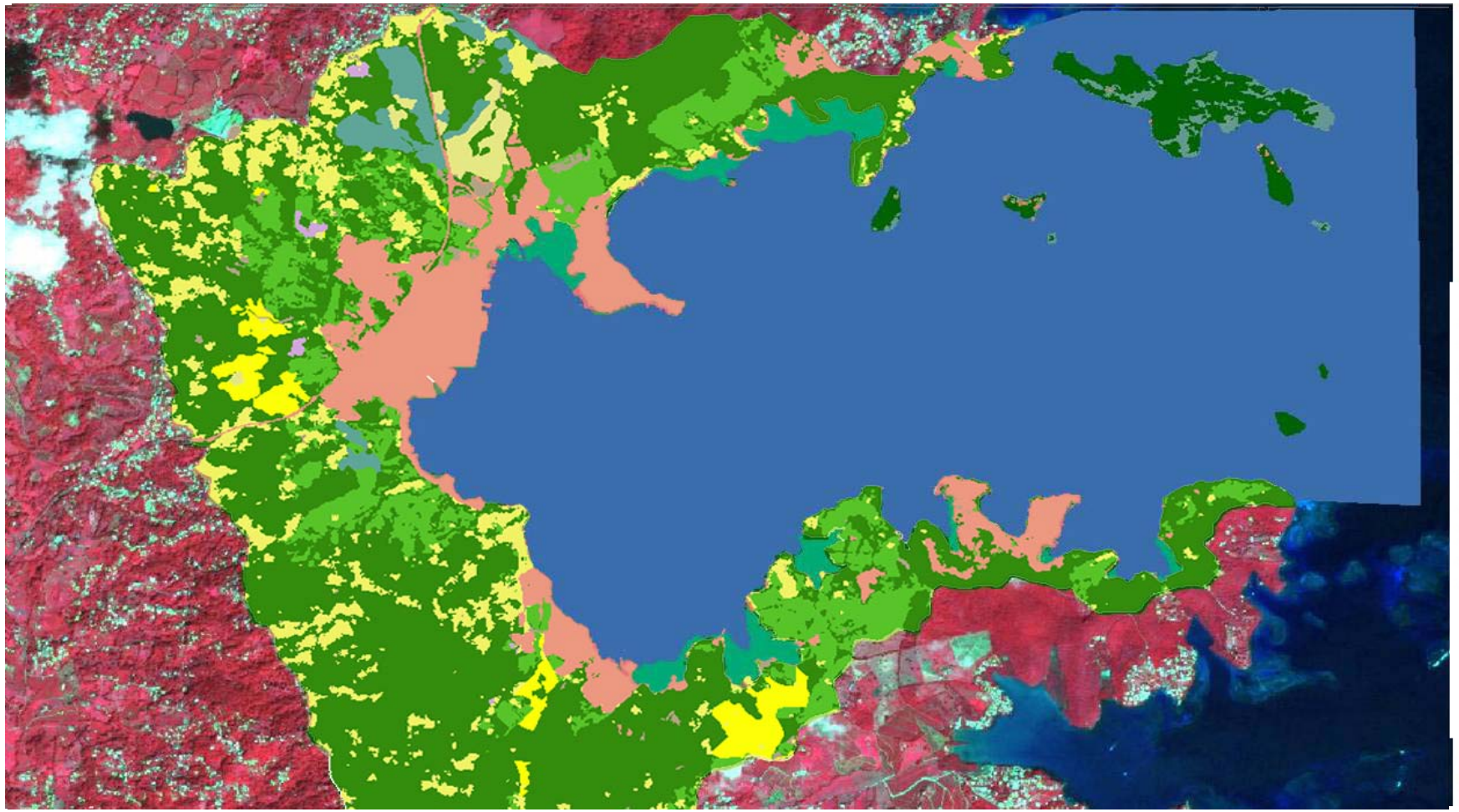
Martinique: map products derived from satellite images

➔ Satellite image classification (14-Nov-2006) simplified

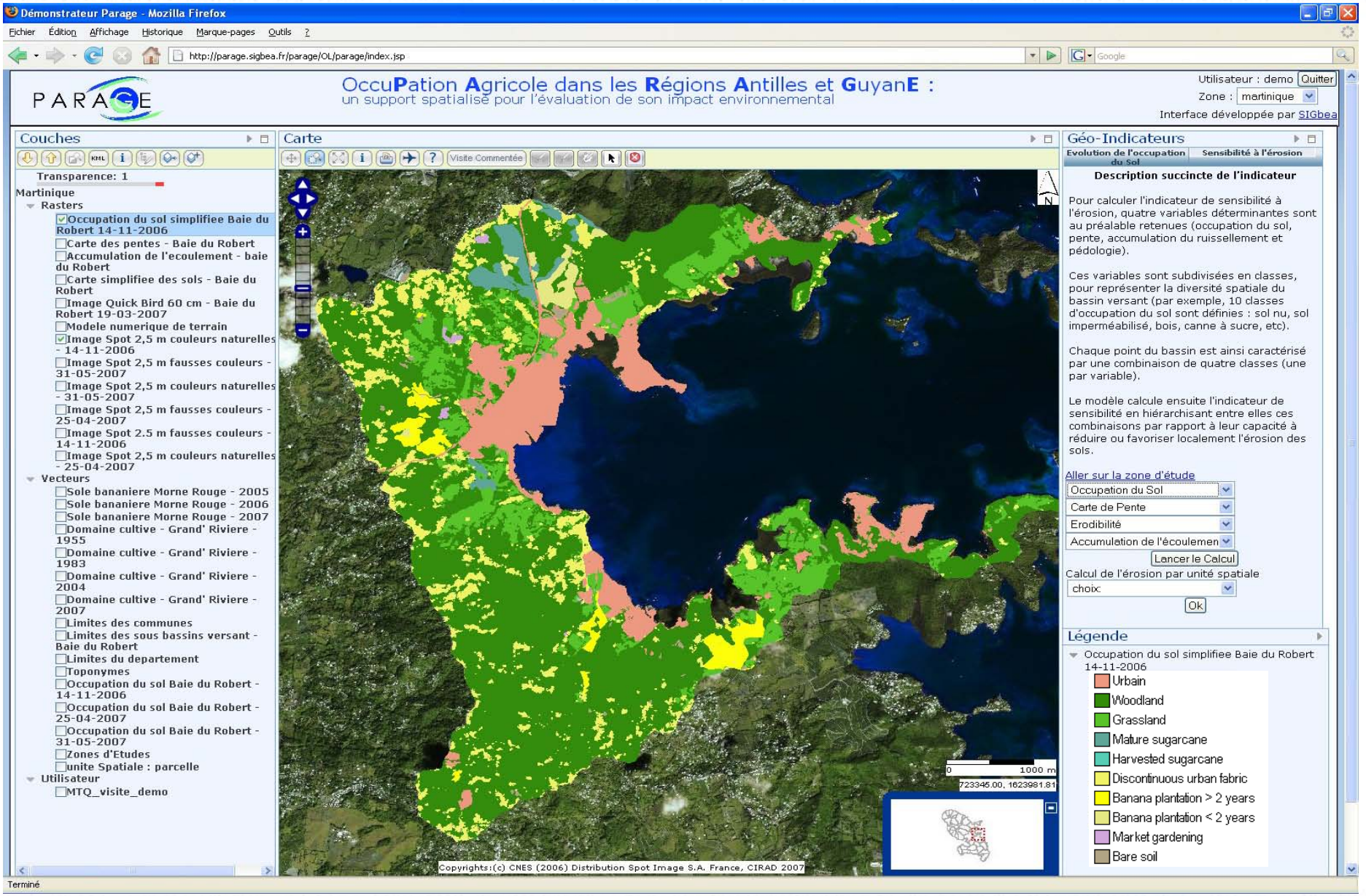


Processing CIRAD

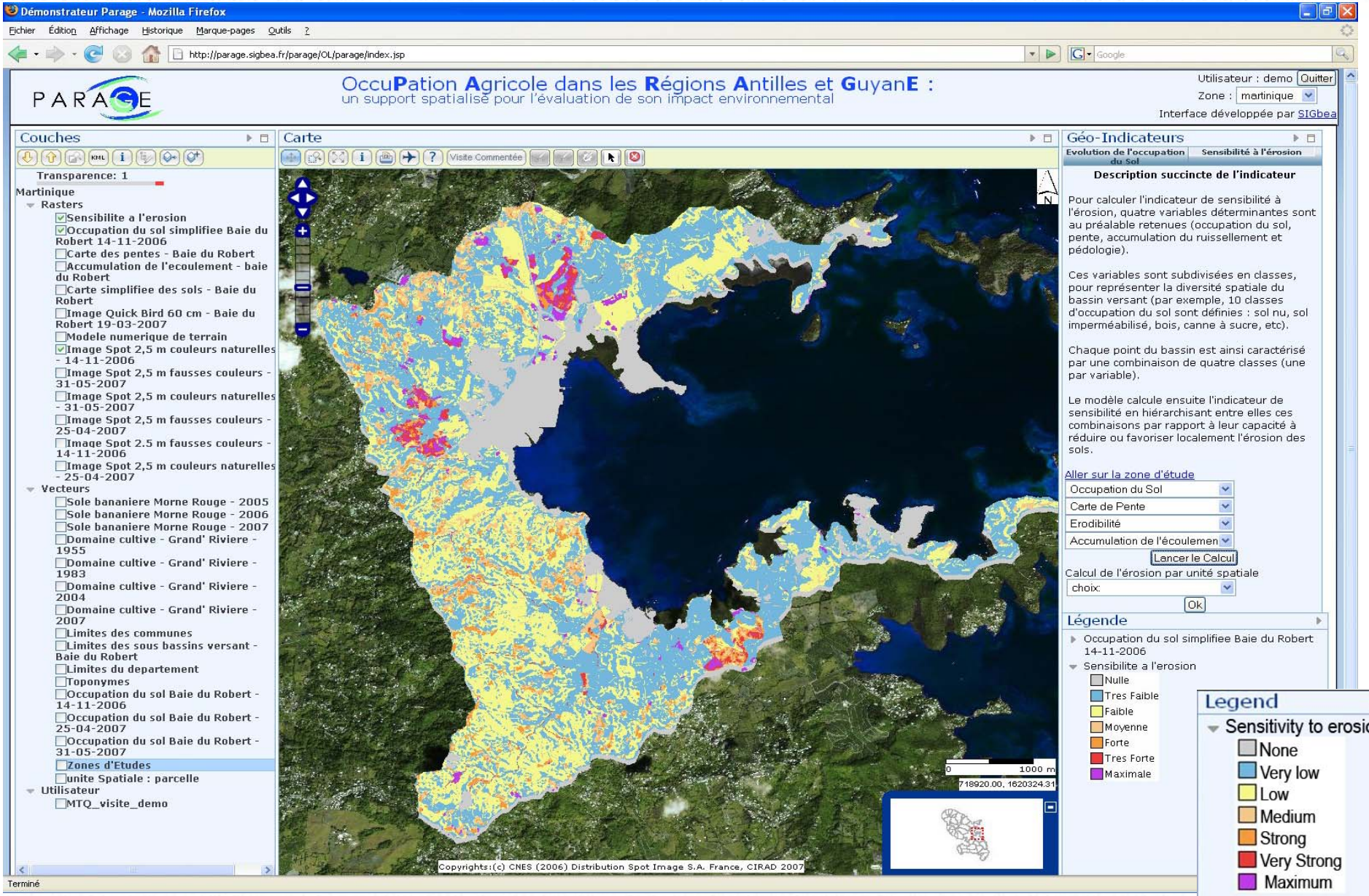
=> Integrated in the GIS prototype for Geo-Indicator calculation…

PARAGE GIS prototype

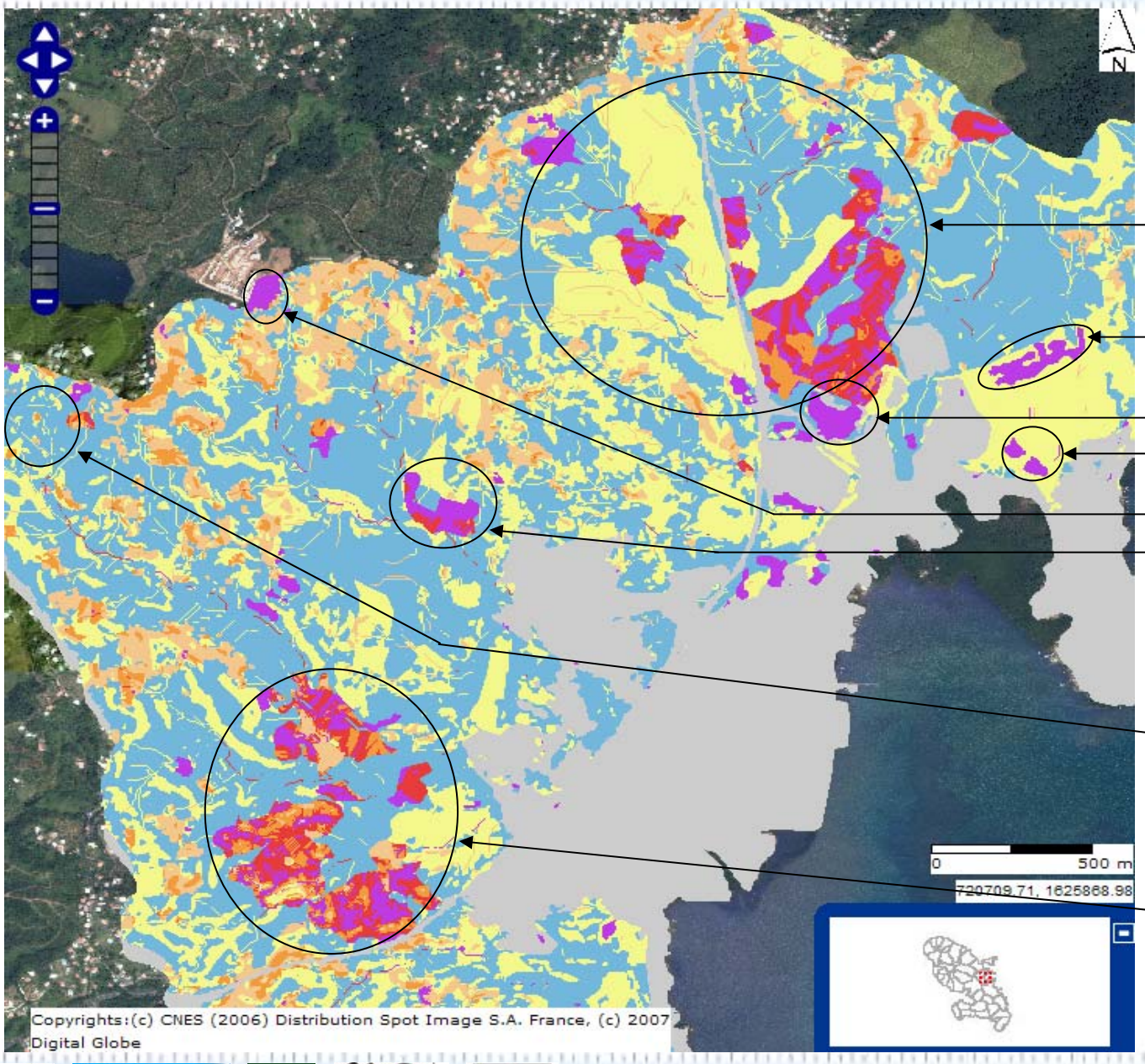
http://parage.sigbea.fr



Martinique: GeoInd. calculation in the PARAGE GIS Prototype



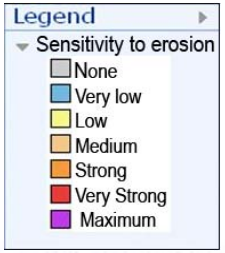
Martinique: GeoInd. calculation - Details (1)



Earthwork

Ploughed fields

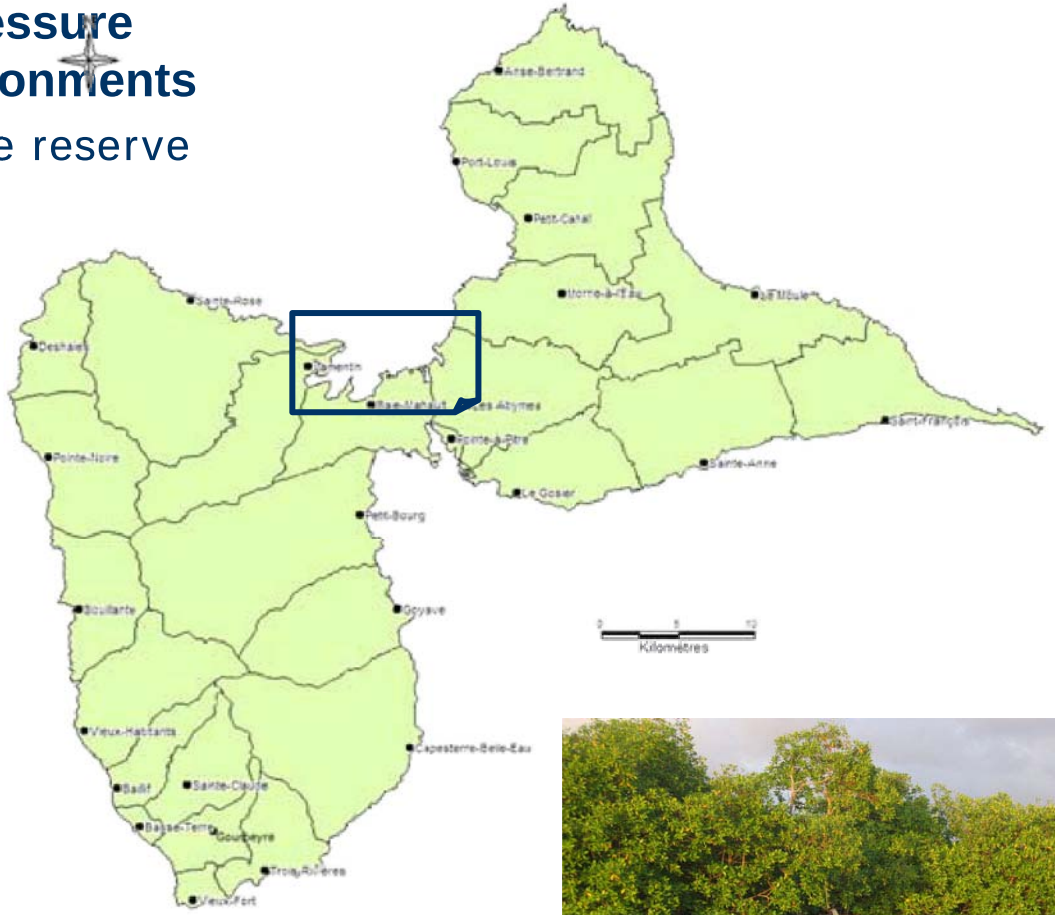
Banana plantation



Results in Guadeloupe

➔ Issue & Study site:

- **Evaluation of the agricultural pressure over sensitive or protected environments**
  - Grand Cul-de-Sac Marin nature reserve (coastal wetland vegetation)



➲ Geo-indicator: « Landscape evolution »

- **assessment of changes in land cover between 2 or more dates**

➔ Map products:

- **Land cover map**

Guadeloupe: Grand Cul-de-Sac Marin Nature Reserve

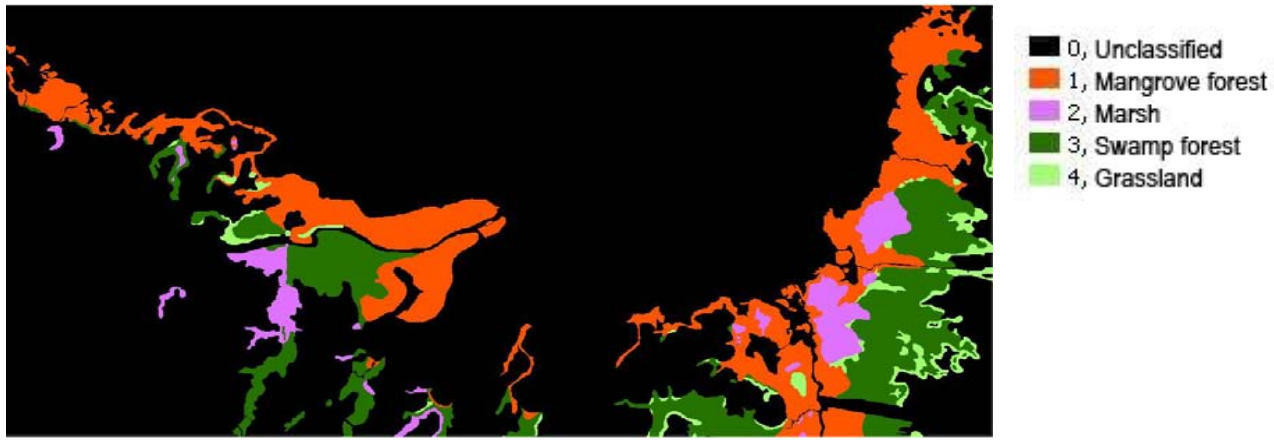
SPOT image from 20-Dec-2006

© CNES, Distribution Spot Image

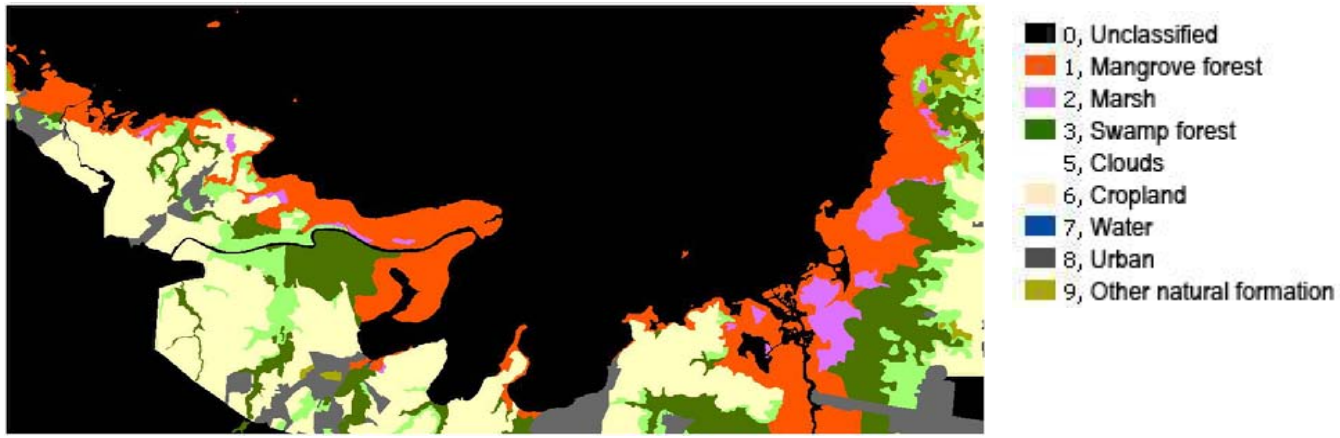
Guadeloupe: history map products

➔ History map nomenclature harmonisation

- **Wetlands DGRST 1989**



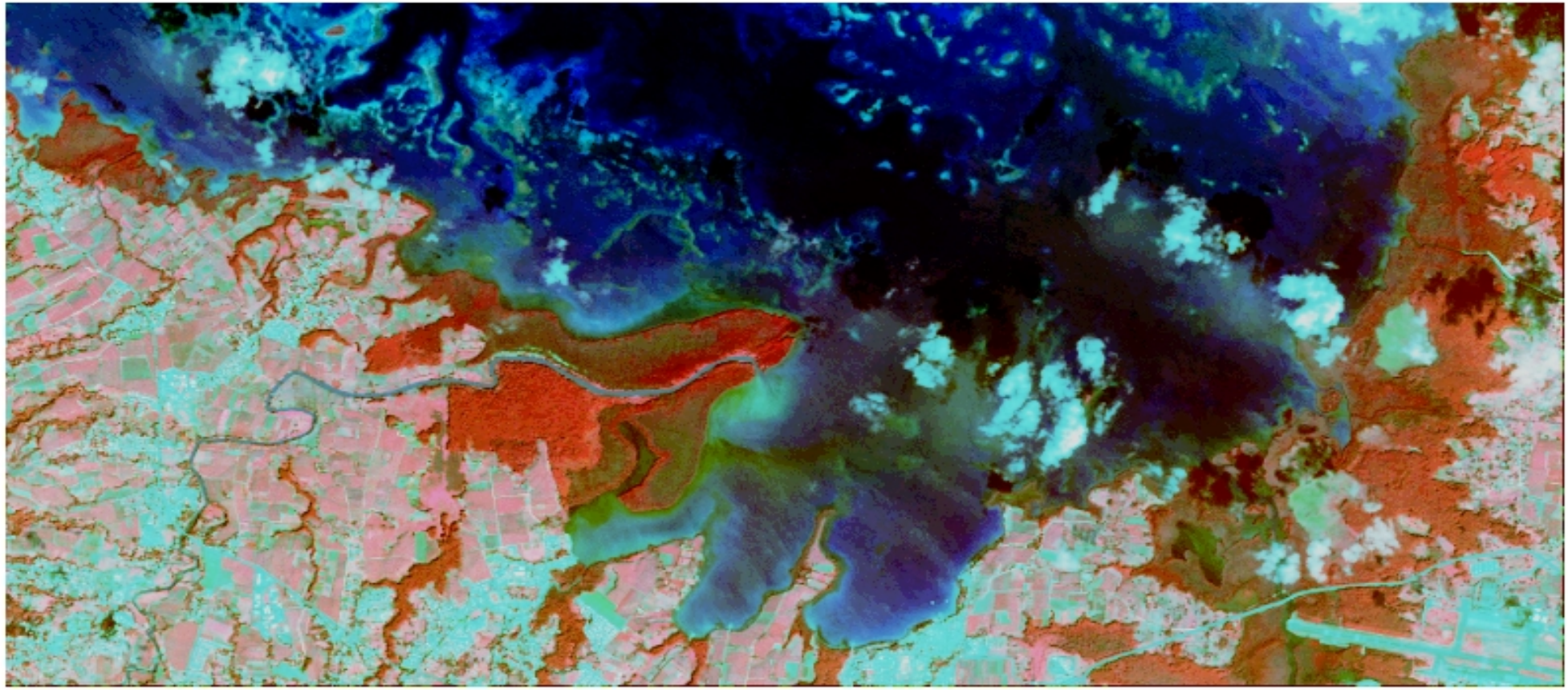
- **Wetlands ONF 1995**



=> Integrated in the GIS prototype for Geo-Indicator calculation…

Guadeloupe: map products derived from satellite images

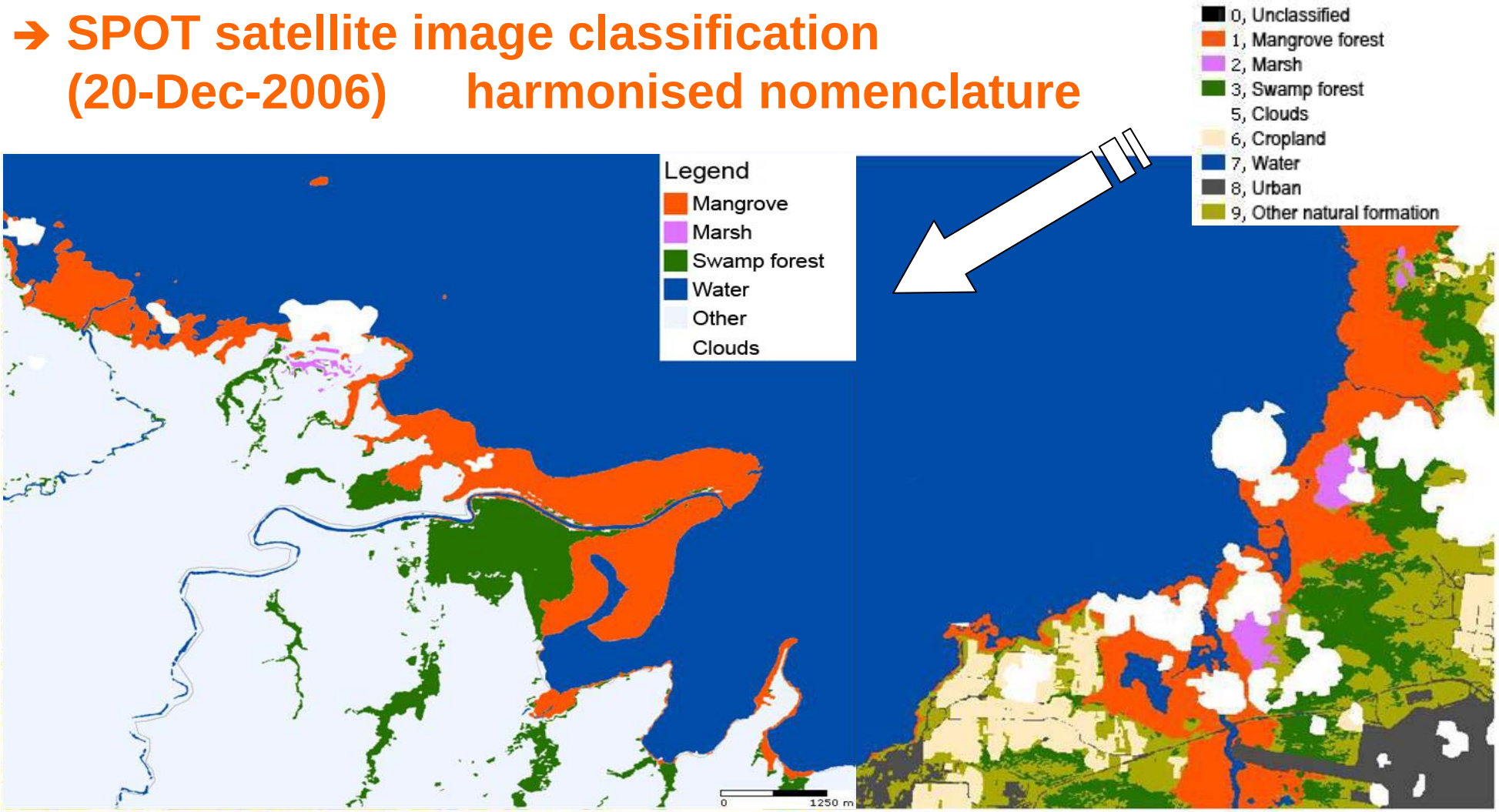
➔ SPOT satellite image classification (20-Dec-2006)



Standard color composite (PIR-R-G)

Guadeloupe: map products derived from satellite images

➔ SPOT satellite image classification (20-Dec-2006) harmonised nomenclature



Processing CIRAD

=> Integrated in the GIS prototype for Geo-Indicator calculation…

PARAGE GIS prototype

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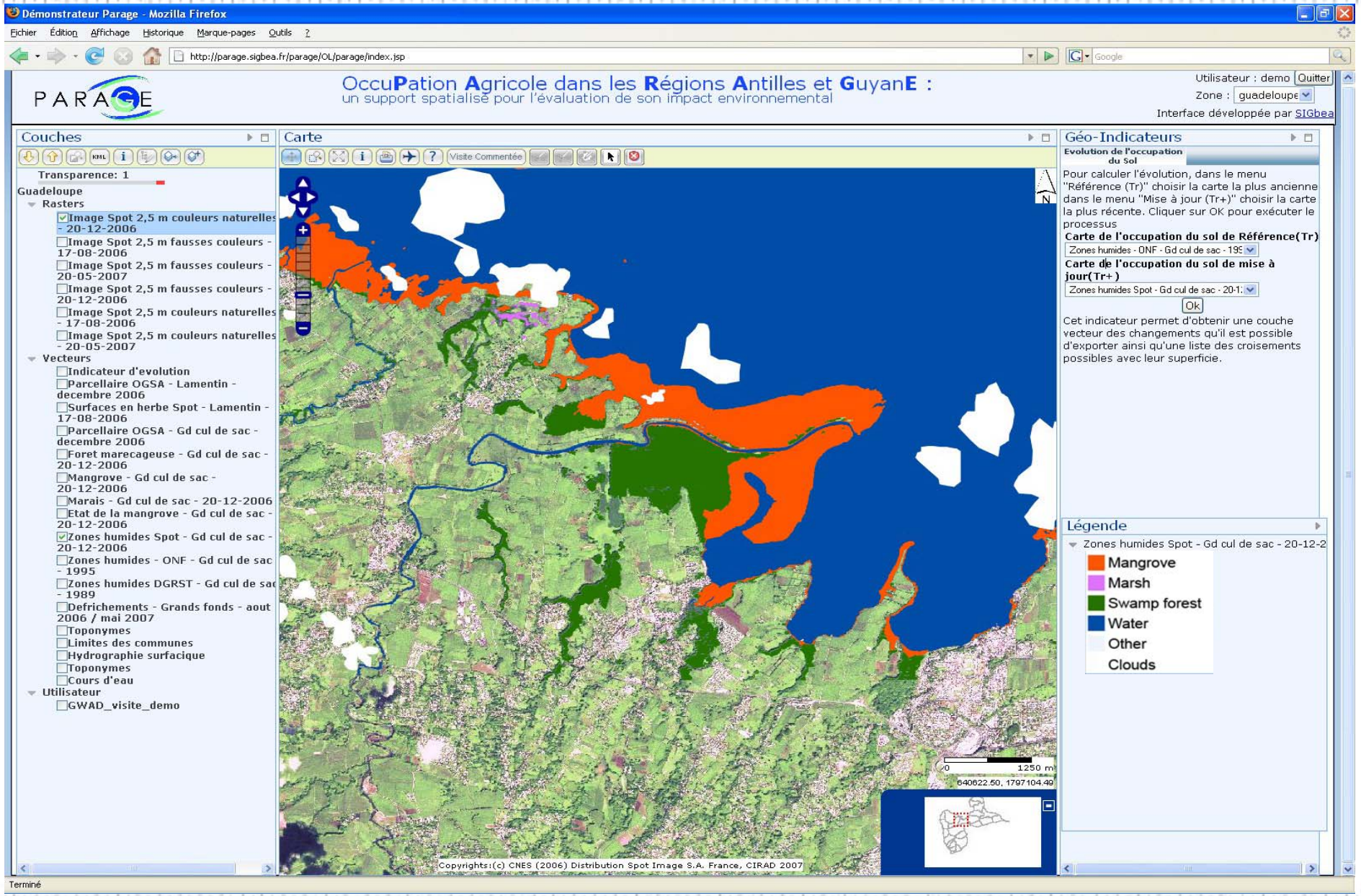
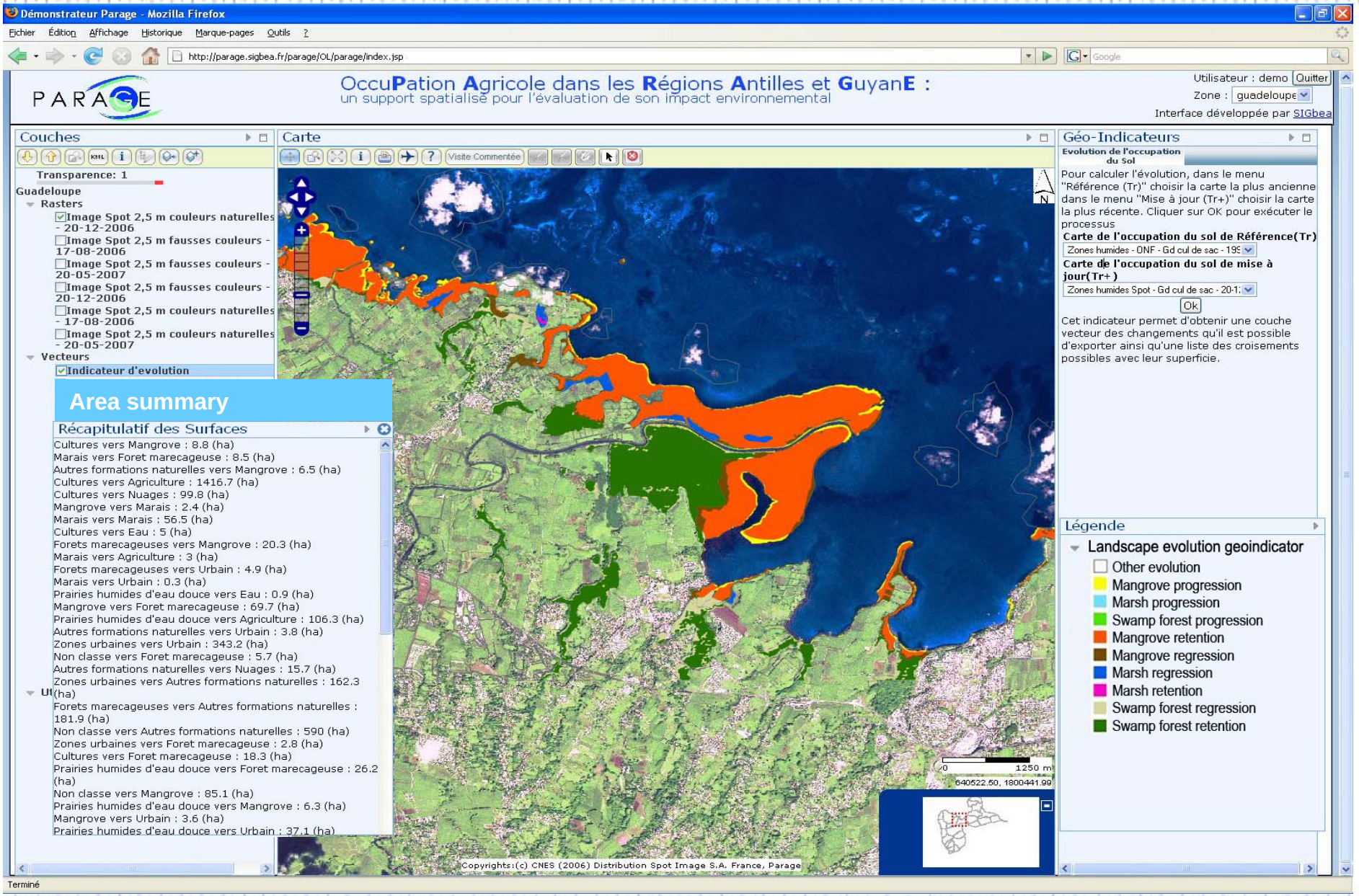


Guadeloupe: GeoInd calculation in the PARAGE GIS Prototype



Results in French Guiana

➔ Issue & Study Site:

- Deforestation monitoring
- Traditional slash-and-burn agriculture
  - Uncontrolled clearance
  - UAA tripled in 20 years
- Saint-Laurent / Apatou road under construction

➲ Geo-indicator: “Landscape evolution”

- assessment of changes in land cover/use between 2 or more dates

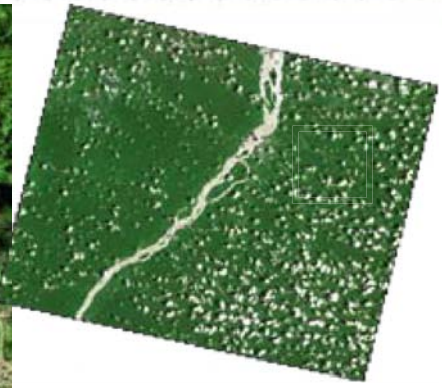
➔ Map products:

- Land cover map
- Land use map

www.guyanecho.com, auteur : M. MORACCHINI

www.guyanecho.com, auteur : D. PAYEUR

French Guiana: clearing along the axis St Laurent - Apatou



SPOT Image from du 05-Oct-2006

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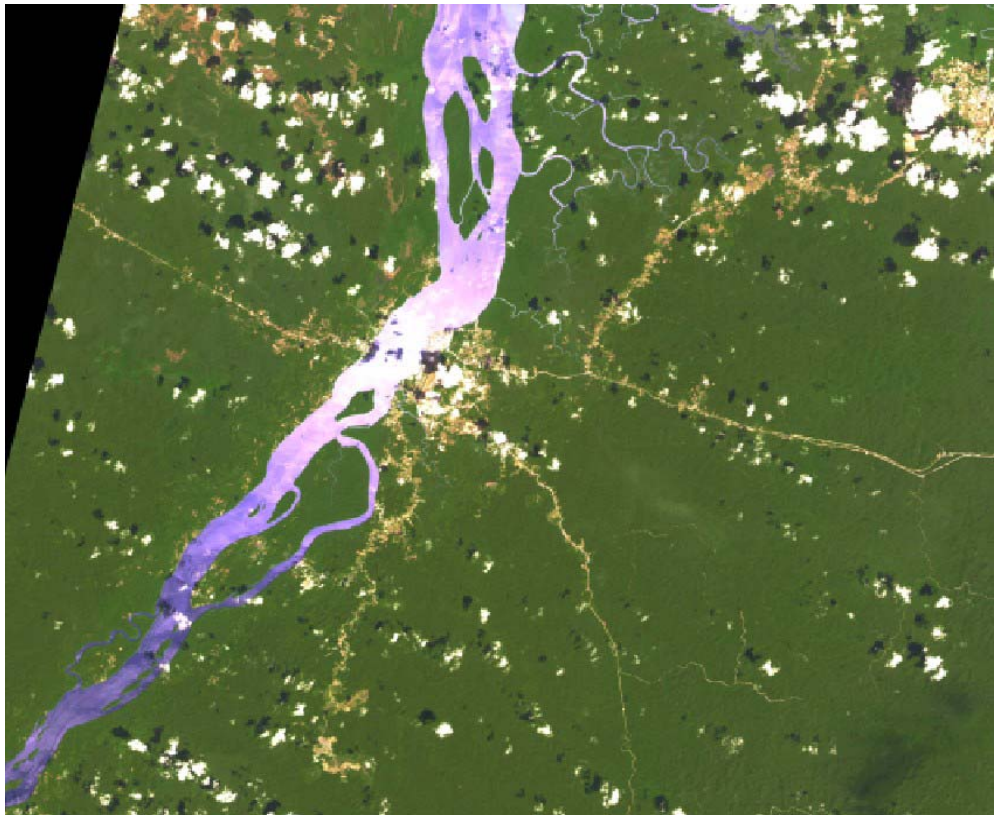
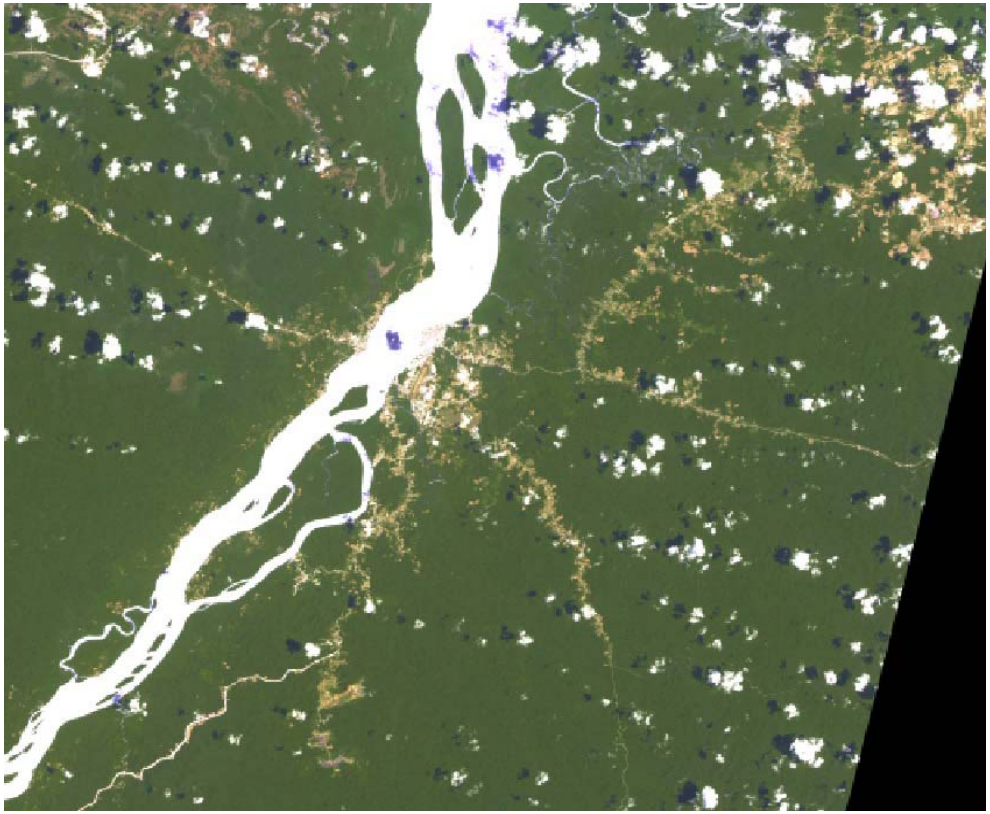
French Guiana: map products

➔ SPOT satellite image classification



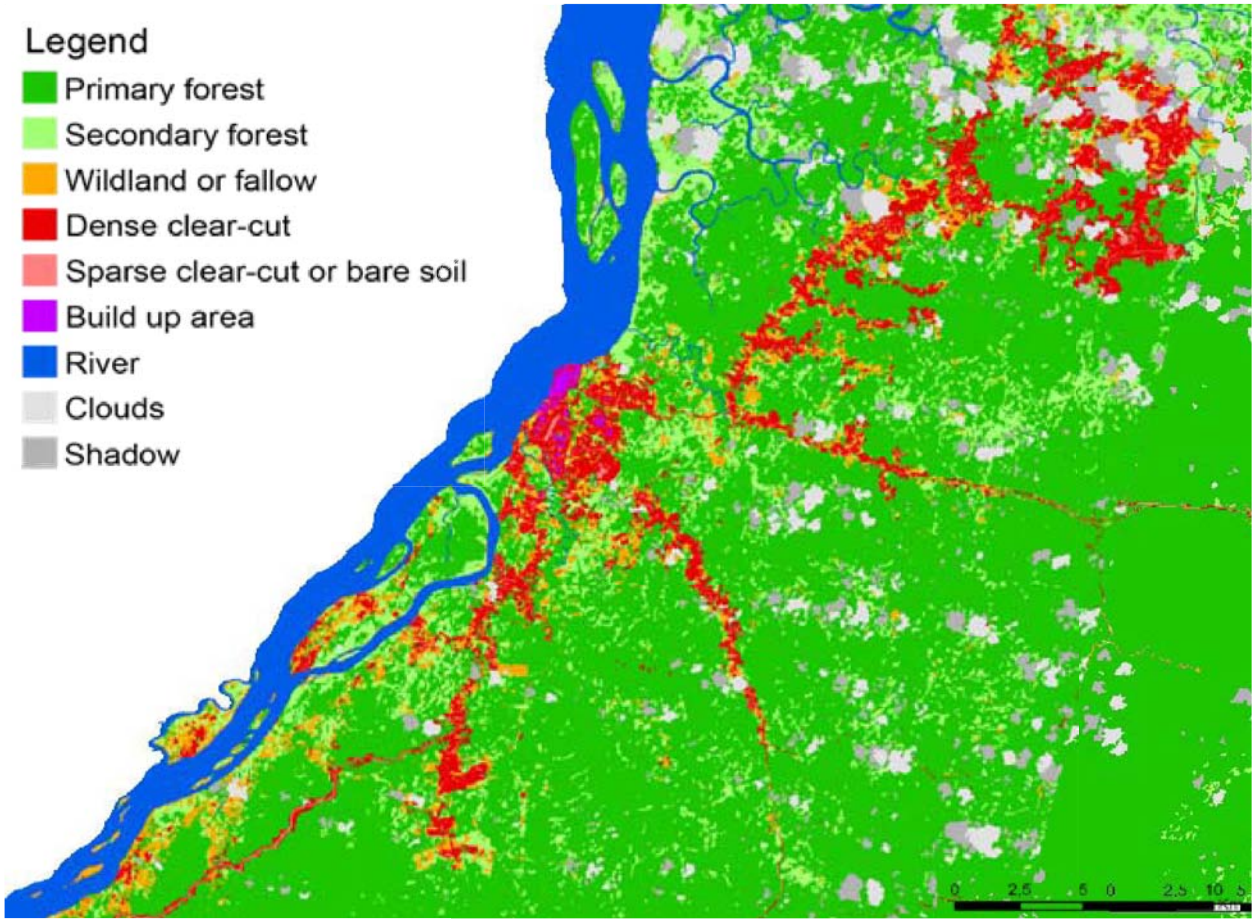
SPOT – November 26th, 1999



SPOT – September 26th, 2006

French Guiana: map products

➔ SPOT satellite image classification



Processing IRD

Land cover map 2006

=> Integrated in the GIS prototype for Geo-Indicator calculation…

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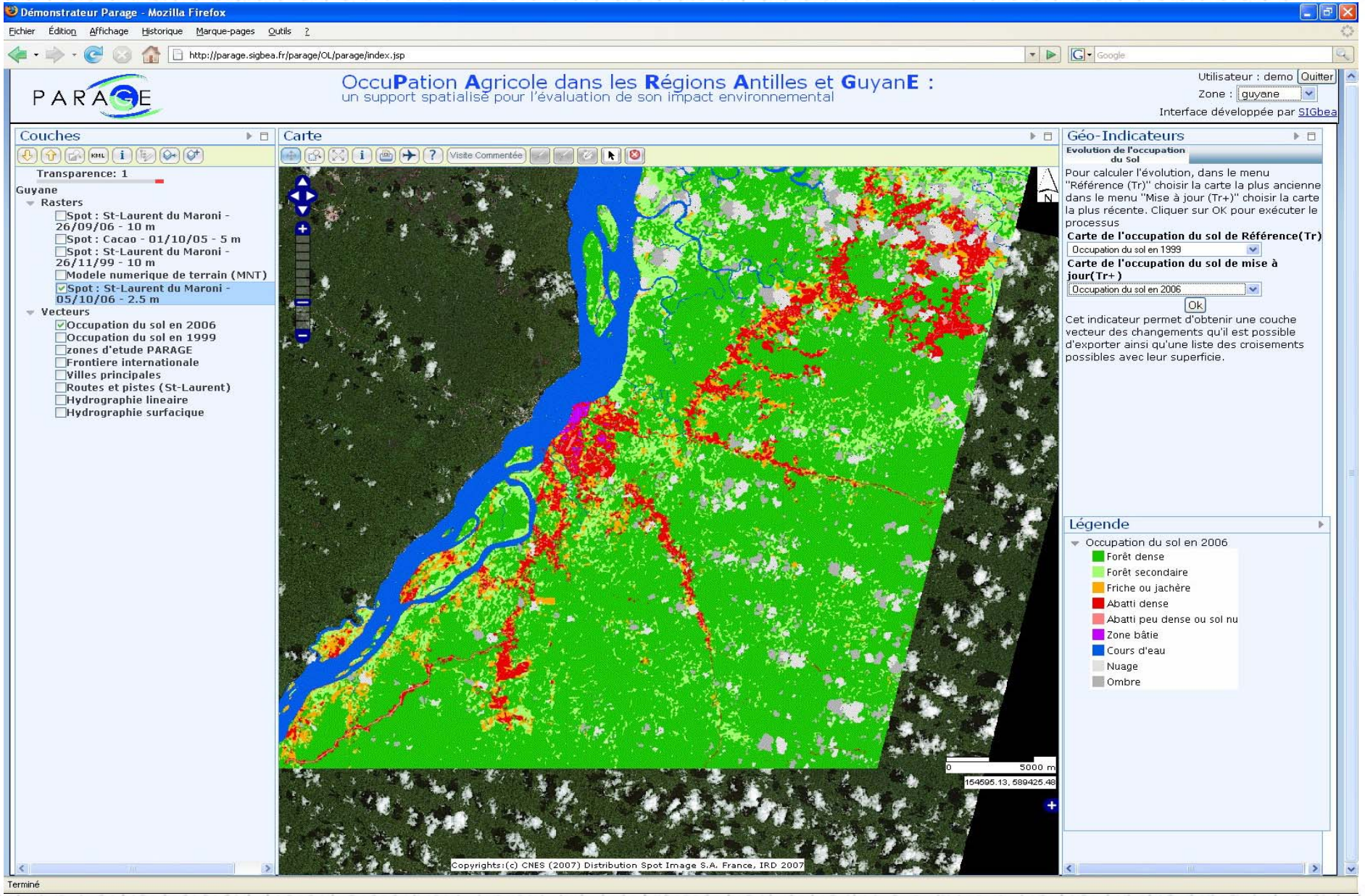
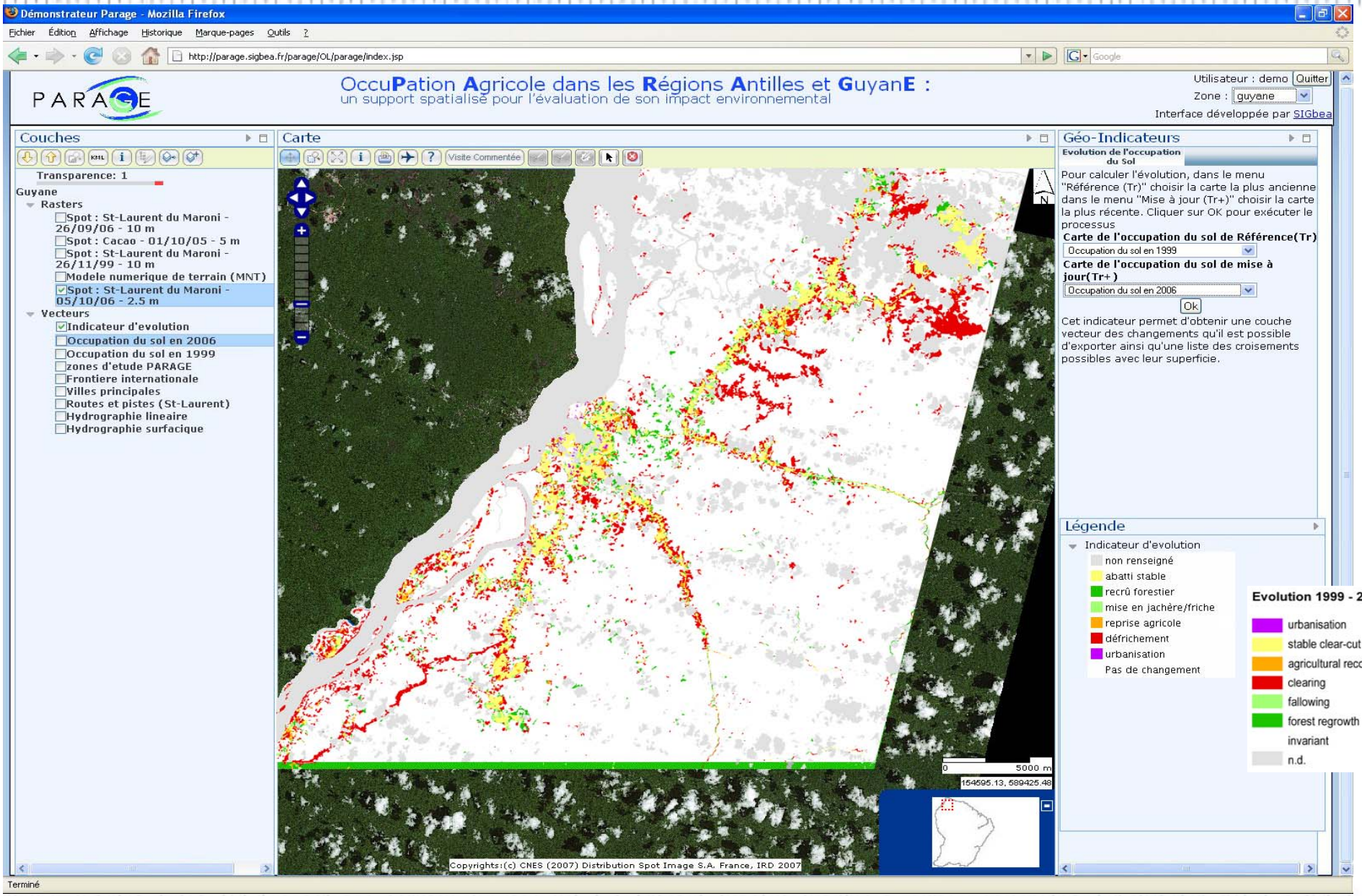


French Guiana: GeoInd calculation in the PARAGE GIS Prototype



Conclusion and Perspective

➔ Conclusion (user evaluation)

- **Map products and Geo-indicators**
  - useful information for territory knowledge diagnosis and monitoring
  - map products and Geo-indicators can be updated regularly (satellite based)
  - methodology applicable in other territories
- **GIS prototype**
  - Web & open source => no need for install
  - from GIS experts to general public
  - simple communication tool
  - information sharing and dissemination
- **Limits**
  - available internet bit rate
  - climatic conditions
  - market gardening or crops under shade issues

⇨ Towards an operational service

- **Geographic extension**
- **Product standardisation**
- **Tool robustness**

PARAGE

Jean-Marie FOTSING
fotsing@orleans.ird.fr

Florence BAILLARIN
Florence.baillarin@spotimage.fr

Site Web & contacts :

http://www.spotimage.fr/

Projet PARAGE

Gérard LAINE
gerard.laine@cirad.fr

Béatrice ARIAUX
bariaux@sigbea.fr